

[54] **POLY(PROPYLENE GLYCOL FUMARATE) COMPOSITIONS FOR BIOMEDICAL APPLICATIONS**

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[58] Field of Search ..... **528/272, 297, 302, 303, 528/296; 523/113; 424/78, 425**

[56] **References Cited**

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[57] **ABSTRACT**

The present invention are highly reproducible poly(-

propylene glycol fumarate) compositions having a controlled end group ratio and range of molecular weights with minimal low molecular weight and excessively high molecular weight fractions, and methods for their manufacture. These compositions, having a preferred weight average molecular weight (Mw) of between about 500 and 3000 and a number average molecular weight (Mn) of between about 300 and 2000, are especially useful in biomedical applications such as in bone cements and tissue implants or glues. In the preferred embodiment, the polymer is prepared from propylene glycol (PG) and fumaric acid (FA) by one of three methods: melt polymerization using non-volatile starting materials; step polymerization where in each step the polymer is increased by the addition of two groups to the polymer ends; or under reaction conditions maintained so that only the condensation byproduct, water, is removed during the reaction, thereby keeping the ratio between PG and FA constant. Variations of the PPF polymers include polymers with increased sensitivity to hydrolysis through incorporation of lactic acid groups into the polymer and polymers formed from maleic acid, maleic anhydride, citraconic acid or citraconic anhydride.

**36 Claims, No Drawings**